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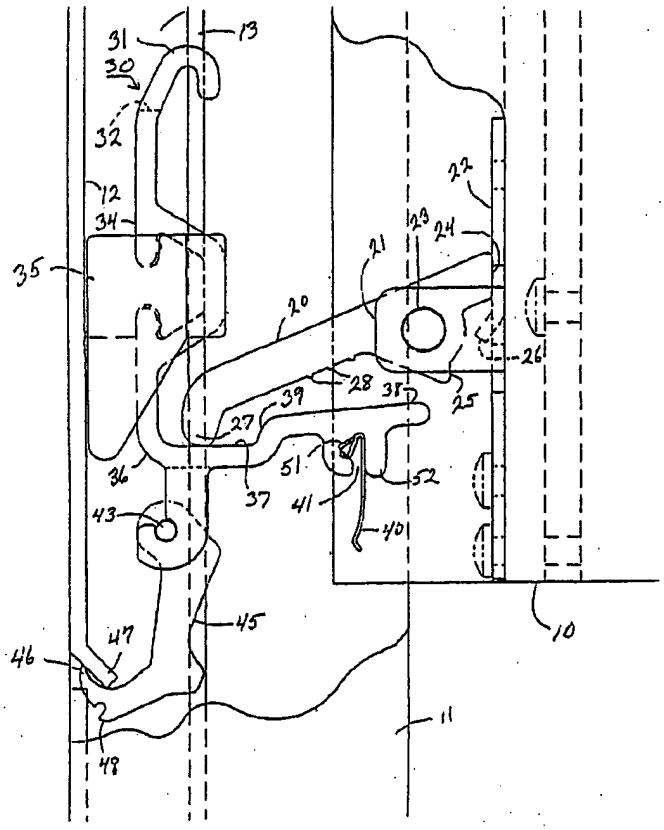

(57) Abrégé/Abstract:
A support system for a heavy sash that is laterally removable from between opposed window jambs includes a pair of sash support arms pivotally mounted on each sash stile and counterbalance shoes that engage the support arms to uphold the sash. The support arms, in inwardly dependent positions, can engage the shoes as a sash is lowered onto the shoes; and the support arms, in outwardly extending positions, support the weight of the sash on the shoes. Hooks dependent from the shoes can lock the shoes to the jambs during sash removal or replacement; and the sash support arms, the shoes, and the hooks are all preferably cut from metal extrusions.

SUPPORT SYSTEM FOR LATERALLY REMOVABLE SASH

Abstract

A support system for a heavy sash that is laterally removable from between opposed window jambs includes a pair of sash support arms pivotally mounted on each sash stile and counterbalance shoes that engage the support arms to uphold the sash. The support arms, in inwardly dependent positions, can engage the shoes as a sash is lowered onto the shoes; and the support arms, in outwardly extending positions, support the weight of the sash on the shoes. Hooks dependent from the shoes can lock the shoes to the jambs during sash removal or replacement; and the sash support arms, the shoes, and the hooks are all preferably cut from metal extrusions.

SUPPORT SYSTEM FOR LATERALLY REMOVABLE SASH

Technical Field

Support and counterbalancing of heavy sash that are laterally removable from between opposed jambs of a window.

Background

This invention improves upon a solution proposed in U.S. Patent No. 5,231,795 for supporting and counterbalancing a heavy sash that is laterally removable from between opposed jambs of a window. The sash counterbalancing and removal problem is the same one addressed in the '795 patent, but the new solution of this invention offers improved performance.

Large and heavy window sash, such as used in schools, offices, and institutional buildings, move vertically between opposed pairs of jambs that are generally extruded of metal. A sash for such a window can weigh over 100 pounds so that a counterbalance system for shoes supporting such a sash must exert a corresponding upward lift. Locking the support shoes of the counterbalance system within the jambs must be secure and reliable, because of the large spring forces involved. Also, the sash support must make a heavy sash easy to raise and lower, and removal and replacement of a sash must be convenient and reliable. Since such windows are often used in schools, the counterbalance support system must also be tamper resistant to the manipulations of curious children. Besides these requirements, an effective window system must accomplish all the necessary functions in a reliable way with elements that are inexpensive to manufacture and maintain.

Summary of the Invention

Our support system for a sash that is laterally removable from between opposed window jambs uses sash support arms that are

movably arranged for transferring the weight of the sash to the shoes and for bridging distances between the sash stiles and the shoes. When not supporting the weight of the sash, the support arms move to positions that allow the sash to be lifted off of counterbalance support shoes and laterally removed from between the window jambs and conversely reinserted between window jambs and lowered onto the shoes. This is done while the shoes are locked in positions within the window jambs. When the support arms support the weight of the sash, they are in positions that rest the sash weight on the counterbalance shoes to support the weight of the sash.

The counterbalance shoes, which are biased upwardly by counterbalance springs, cooperate with the sash support arms. The shoes receive and support the sash weight transferred to the shoes by the sash support arms, and the shoes have hooks that can be deployed to lock the shoes reliably in the jambs by engaging projections formed in the jambs for this purpose. The hooks are latched in undeployed positions and can be unlatched to engage the jambs' projections and lock the shoes against upward movement.

Several components of the inventive sash support system are preferably formed of metal extrusions. These include the shoes, the sash support arms, and the locking hooks for the shoes. Extrusions for these elements are formed in predetermined cross-sectional configurations and are cut to suitable widths to perform the necessary cooperative functions.

Forming sash support elements of extruded metal lowers the cost of the system while also providing the strength necessary for supporting a heavy sash. Extruded metal elements also accommodate the configurations necessary for the interactions between the shoes and the sash support arms. Altogether, the improvements of this invention allow easier raising and lowering of the sash, more convenient sash removal and replacement, and a more convenient way of locking the shoes in place. They also allow all this to be accomplished with a system that is less costly to manufacture and maintain.

Drawings

Figures 1-3 schematically illustrate the removal and replacement of a sash supported by the inventive system with the sash moved laterally for removal or insertion in FIG. 1, lifted above or lowered onto counterbalance shoes in FIG. 2, and supported on counterbalance shoes in FIG. 3.

Figures 4 and 5 are partially cut-away elevational views showing preferred embodiments of sash support arms and counterbalance shoes, with a shoe locked in a jamb in FIG. 4 and unlocked from a jamb in FIG. 5.

Figure 6 is an exploded isometric rear corner view of the shoe of FIGS. 4 and 5.

Figure 7 is an isometric rear corner view of the shoe of FIG. 6 shown in assembled condition.

Figure 8 is an isometric front corner view of the shoe of FIGS. 6 and 7.

Figures 9 and 10 are partially cut-away views of a sash support arm shown in an outwardly extending position in FIG. 9 and in a downwardly dependent position in FIG. 10.

Figures 11 and 12 are isometric views respectively from above and below guide blocks for the shoes of FIGS. 6-8.

Detailed Description

A sash supported according to this invention is laterally removable from between a pair of opposed window jambs in a way that is similar to the sash removal shown in U.S. Patent No. 5,231,795. Otherwise, the improved sash support system, including sash support arms, sash shoes, and shoe-locking hooks, differs significantly from the '795 patent.

The basic operation of a preferred embodiment of the inventive system is shown schematically in FIGS. 1-3. Sash 10, as shown in

FIG. 1, is lifted off of shoes 30 that are locked in place within jambs 11, which are illustrated by broken lines extending along the light opening between jambs 11. For heavy sash that benefit from the inventive support system, jambs 11 are generally extruded of metal to allow lateral room for maneuvering sash 10 in between and out from between jambs 11. Jambs 11 are essentially the same as jambs used with the sash support system of the '795 patent, and such jambs are available in different dimensions to accommodate different sizes of sash 10 and corresponding counterbalance systems. Sash 10, in the position shown in FIG. 1, is also moved laterally within jambs 11 to free one stile edge of sash 10 from jambs 11 for maneuvering sash 10 out from between jambs 11 or back into a position between jambs 11.

In the position shown in FIG. 2, sash 10 is centered between jambs 11 but elevated above locked shoes 30, as it is lifted off from or lowered onto shoes 30. In the position shown in FIG. 3, sash 10 is again centered between jambs 11, but is lowered onto shoes 30, which are no longer locked within jambs 11. In the supported position shown in FIG. 3, sash 10 rests on and is supported by shoes 30 by means of sash support arms 20 that are moved to an outward position. Arms 20 are in inward positions when sash 10 is lifted off of shoes 30, as shown in FIGS. 1 and 2.

Besides the preferred pivoting of sash support arms 20 on the stiles of sash 10, as illustrated in FIGS. 1-3, it is also possible to arrange sash support arms that are pivotally mounted on shoes 30. With such an arrangement, shoe mounted sash support arms would pivot inward to engage sash stiles and support the weight of a sash engaged by the arms, which are preferably braced against pivoting when in a support position. Pivoting the support arms on the shoes can thus achieve a similar result to the preferred pivoting of the support arms on the sash stiles. Either way, the support arms transfer the sash weight to the shoes and move from sash support positions when the sash is uplifted from the shoes, to allow lateral movement and withdrawal of the sash from the jambs.

More details of a preferred embodiment of a sash support system are illustrated in FIGS. 4-12. The preferred system elements include sash support arms, counterbalance shoes, and shoe-locking hooks.

Sash Support Arms

A support arm 20 is preferably pivotally mounted on each opposite stile of sash 10. Mounts for support arms 20 are preferably near lower corners of sash stiles, but more elevated mounts are also possible. As best shown in FIGS. 4, 5, 9, and 10, support arms 20 are pivotally mounted on brackets 21 of mounts 22 that are secured to the stiles of sash 10, which have a recessed edge groove that receives mount brackets 22. Pivot pins 23 support arms 20 on brackets 21 to pivot between outwardly extending positions shown in FIGS. 4, 5, and 9 and downwardly dependent positions shown in FIGS. 1, 2, and 10.

Each of these positions is limited and braced by mount block 22. In the outwardly extending position, an end 24 of arm 20 abuts against mount 22 to brace arm 20 against pivoting upward. In the downwardly dependent position, an abutment 25 on support arm 20 engages a lance 26 on mount block 22 to prevent pivoting of support arm 20 downward or inward beyond the position shown in FIG. 10.

An outer end 27 of support arm 20 engages a sash shoe, as explained in more detail below. Support arms 20 having different lengths from pivot pin 23 to arm end 27 are desirable to accommodate different dimensions of window systems. Support arms 20 are also preferably formed of extruded metal, which helps make different lengths of support arms 20 inexpensive. To distinguish between support arms 20 of different lengths, the arms are preferably formed with extruded coding lines 28. For example, three coding lines 28 are illustrated in FIGS. 4 and 5 to indicate long support arms 20, and two coding lines 28 are illustrated in FIGS. 9 and 10 to indicate medium length support arms 20. Not only can different numbers of coding lines 28 be used, but these can also be positioned in different places on an extrusion from which support arms 20 are cut. Extrusion fabrication also allows support arms 20

to be cut to different widths, if necessary, to accommodate different window dimensions and sash weights.

Counterbalance Shoes

Counterbalance shoes 30 are also preferably formed of metal extrusions. Shoes 30 can then be cut to the desired shoe width from a length of extruded material having the necessary cross-sectional configuration to provide the required shoe functions.

An upper region 31 of shoe 30 preferably has a hook shape in which slots 32 are cut, as shown in FIGS. 6-8, to interconnect with the lower ends of counterbalance elements that are not shown. Shoes 30 can accommodate different numbers of counterbalance elements received in correspondingly different numbers of slots 32, especially when shoes are cut to different widths. This readily adapts a single extrusion for shoes 30 to accommodate different window dimensions and sash weights.

Preferably a mid-region 34 of shoe 30 has a groove 33 that receives and holds a guide block 35. Groove 33 and guide block 35 are shaped so that block 35 can be slid endwise into groove 33 where it is frictionally held in place. Block 35 is preferably molded of resin material and configured to bear against a rear wall 12 of jamb 11 and against fins 13 that extend inward in jamb 11. Guide block 35 gives shoe 30 a smooth running fit within a channel 14 formed behind fins 13 in a rear region of jamb 11 spaced outward from sash 10. Channel 14 then serves as a vertical run for block 35 which in turn guides shoe 30 vertically within jamb 11, while holding shoe 30 away from any metal-to-metal contact with jamb 11. Guide block 35 can have many configurations that perform the necessary guiding function, which includes both vertical guidance and resistance to torsion applied to shoe 30 by counterbalance elements to which it is connected.

A lower region 36 of shoe 30 has a sash support platform 37 that is engaged by the ends 27 of sash support arms 20 to uphold the weight of sash 10. Platforms 37 extend toward sash 10 far enough to engage sash support arms 20 in their inward positions illustrated

In FIG. 10. The extension of platforms 37 towards sash 10 also leaves free room above platforms 37 for sash 10 to be moved laterally while it is raised above platforms 37 and maneuvered out of or into the space between opposed jambs 11.

As a sash 10 is lowered into a supported position on shoes 30, the ends 27 of support arms 20 first engage inner end regions 38 of support platforms 37; and then as sash 10 is further lowered, arm ends 27 slide outward along platforms 37 to the support position illustrated in FIGS. 4 and 5. The reverse occurs as sash 10 is lifted up off of shoes 30.

The small step 39 in platform 37 is preferred for resisting lateral movement of sash 10 while resting on shoes 30 and as a positive indication that arm ends 27 of a sash being lowered have reached appropriately supported positions on platforms 37. The regions where arm ends 27 support sash 10 on platforms 37 are preferably directly below slots 32 where counterbalance elements exert an upward force on upper regions 31 of shoes 30. This minimizes any moment arms tending to turn shoes 30 around horizontal axes.

Shoe-locking Hooks

Below platform 37 is preferably arranged a groove 44 that receives a pivot pin 43 for a shoe-locking hook 45. Pin 43 can be pressed axially into groove 44 and through hook 45 to leave hook 45 pivotally hanging below platform 37, as illustrated in FIGS. 4, 7, and 8. The center of gravity of hook 45 is arranged toward the sash side of pivot pin 43 so that the end 46 of hook 45 bears against the rear wall 12 of jamb 11. There, hook end 46 interlocks with a projection or lance 47 formed in jamb wall 12, as illustrated in FIG. 4.

The underside of the inward region 38 of support platform 37 preferably has a groove 41 that receives and retains a resilient latch spring 40. An anchored end 51 of spring 40 can be pressed into slot 41 to retain spring 40 frictionally in place. A downwardly extending projection 52 engages spring 40 to prevent movement beyond a resilient latching position, as illustrated.

Hook 45 has a latching nose 48 that latches into an opening 42 in spring 40, as illustrated in FIG. 5. Latching nose 48 and spring 40 are preferably configured so that shoe-locking hook 45 can be manually pushed into the latched position shown in FIG. 5. Unlatching shoe lock 45 for deployment preferably requires pressing a screwdriver blade in between hook end 46 and the free end 49 of spring 40. This makes the accidental deployment of shoe locks 45 unlikely.

Shoe lock 45 is also preferably cut from an indefinite length of a metal extrusion. This can give hook 45 the necessary strength to resist the counterbalance bias, while also keeping hook 45 inexpensive. Although lances 47 are preferred for their simplicity and effectiveness in interacting with locks 45, other projections or interlock discontinuities in jamb 11 are also possible.

When the elements of the inventive sash support system are assembled and operated, as shown schematically in FIGS. 1-3, they meet all the objectives of the invention. They reduce the cost of a sash support system while improving its convenience, effectiveness, and reliability. They also allow a window sash to be easily raised or lowered by a person who may weigh less than the sash.

We Claim:

1. A system supporting a sash that is laterally removable from between opposed window jambs, the system comprising:

a. a pair of sash support arms mounted to hang freely downward on respective opposite stiles of the sash and to pivot from downwardly hanging positions to outwardly extended positions that the support arms assume when supporting the sash;

b. the sash support arms in the downwardly hanging positions being disposed so that as the sash is lowered toward a supported position, the downwardly hanging arms engage sash supporting platforms of counterbalanced sash shoes locked into the jambs so that sash-lowering engagement between the arms and the platforms pivots the arms outward along the platforms; and

c. outer end regions of the sash support arms in the outwardly extended positions resting on regions of the platforms spaced from the sash and arranged vertically under counterbalance elements connected to the shoes to support the weight of the sash.

2. The system of claim 1 wherein the sash supporting platforms of the shoes extend toward the sash stiles so that inner regions of the platforms engage the sash support arms in the downwardly hanging positions and so that outer regions of the platforms engage the outer end regions of the sash support arms in the outwardly extended positions.

3. The system of claim 2 wherein the counterbalance elements are connected to the shoes in regions vertically above the outer platform regions.

4. The system of claim 1 wherein the shoes include locking elements deployable to lock the shoes to jamb projections during removal and replacement of the sash.

5. The system of claim 4 wherein the locking elements are pivotally mounted on the shoes and latched in undeployed positions out of engagement with window jambs.

6. The system of claim 4 wherein the locking elements are formed as extruded metal hooks.

7. The system of claim 1 wherein the shoes and the sash support arms are each formed of metal extrusions having evenly extending profiles.

8. The system of claim 7 wherein the shoes are available in different widths formed as different predetermined lengths of the shoe extrusion so that different widths of shoes fit different widths of jamb channels.

9. The system of claim 8 wherein shoes of different widths are adapted to connect to different numbers of counterbalance elements.

10. The system of claim 7 wherein the extrusions for the sash support arms are available in different lengths to fit different jamb dimensions.

11. The system of claim 10 wherein the different length sash support arms have extruded code lines indicating size.

12. In a system counterbalancing a window sash supported by a pair of counterbalanced sash shoes so that the sash extends between a pair of jambs from which the sash is removable by maneuvering the sash upward and laterally while the shoes are locked in the jambs, the improvement comprising:

a. the shoes being formed of a metal extrusion having a predetermined profile extending evenly for a width of the shoes and establishing an elevational configuration of the shoes; and

b. the elevational configuration extending integrally between a hook-shaped upper region formed to interconnect with a counterbalance element and an L-shaped lower region forming a platform extending toward the sash from vertically below the upper region.

13. The improvement of claim 12 wherein the sash is supported on the shoes by sash support arms formed of a metal extrusion having an evenly extending profile.

14. The improvement of claim 13 wherein the sash support arms are movably mounted on the sash to rest on the shoes in outwardly extending positions of the sash support arms located vertically below the upper region interconnected with the counterbalance elements.

15. The improvement of claim 13 wherein the sash support arms are mounted on the sash to pivot between outwardly extending positions supporting the sash and downwardly hanging positions that the support arms assume when not supporting the sash.

16. The improvement of claim 12 wherein the shoes include locking elements that engage jamb projections to lock the shoes during sash removal and replacement.

17. The improvement of claim 16 wherein the locking elements are formed of a metal extrusion and are pivotally mounted on the shoes.

18. The improvement of claim 16 wherein the locking elements are formed as hooks that catch on the jamb projections and the shoes have latches that latch the locking elements in undeployed positions out of engagement with window jambs.

19. The improvement of claim 12 wherein the elevational configuration of a mid-region of the shoe is formed to support a guide that slides in a jamb to guide vertical movement of the shoe.

20. The improvement of claim 19 wherein the profile configures a guide retaining groove that receives the guide.

21. The improvement of claim 20 wherein the profile configures a latch retaining groove for receiving a hook latch and a pin groove for receiving a pivot pin of the shoe hook.

22. The improvement of claim 12 wherein the shoes are formed of predeterminedly variable lengths of the extrusion to form shoes of different widths fitting different sizes of jamb channels.

23. The improvement of claim 22 wherein shoes of different widths have upper regions adapted to interconnect to different numbers of counterbalance elements.

24. The improvement of claim 13 wherein different metal extrusions having different evenly extending profile lengths form sash support arms available in different lengths to accommodate different distances between opposite shoes.

25. The improvement of claim 24 wherein the different lengths of sash support arms have extruded code lines indicating size.

26. A method of removing a window sash from between opposed window jambs where the sash is supported on a pair of counterbalanced shoes arranged for moving within the jambs, the method comprising:

a. releasing shoe hooks from latched positions on each of the shoes to deploy the hooks to hang dependently from the shoes;

b. raising the sash and the shoes so that the hooks move upward from positions below lances in the jambs and engage the lances in the dependent positions of the hooks to lock the shoes against upward movement; and

c. lifting the sash above the hook-locked shoes and laterally withdrawing the sash from between the jambs.

27. The method of claim 26 including releasing a spring clip for unlatching the shoe hooks.

28. The method of claim 26 wherein releasing the shoe hooks allows the shoe hooks to pivot downward to deployed positions where tips of the hooks engage the jambs.

29. A counterbalance sash shoe comprising:

a. a metal extrusion having a predetermined, evenly extending profile establishing an elevational configuration of the shoe;

b. the elevational configuration extending integrally downward from an upper region of the shoe formed in a hook shape to interconnect with a counterbalance to a lower region of the shoe formed as a platform to support a sash; and

c. the shoe having a width established by a predetermined length of the extrusion.

30. The shoe of claim 29 including a locking hook mounted on the shoe and deployable to an operative position in which the hook hangs downward from the shoe.

31. The shoe of claim 30 wherein the hook is formed of a metal extrusion having an evenly extending profile.

32. The shoe of claim 30 including a spring latch for retaining the hook in an inoperative position in which the hook does not hang downward from the shoe.

33. The shoe of claim 32 wherein the hook is manually movable to a latched engagement with the spring latch and is unlatched from the spring latch by pressing between ends of the hook and the spring latch.

34. The shoe of claim 30 wherein the profile configures a pin groove for receiving a pin for pivoting the hook and a spring groove for retaining the spring latch.

35. The shoe of claim 29 including a guide mounted on the shoe between the platform and the upper region, the guide being formed of resin material.

36. The shoe of claim 35 wherein the profile configures a mid-region of the shoe to have an interlock for holding the guide.

37. The shoe of claim 29 wherein the shoe is available in different widths set by different predetermined lengths of the extrusion to fit different sizes of jamb channels.

38. The shoe of claim 37 wherein the upper regions of shoes of different widths are adapted to connect to different numbers of counterbalance elements.

39. A sash support system comprising:

a. a plurality of sash support elements each formed of a metal extrusion having an evenly extending profile establishing an elevational configuration of the element;

b. the elevational configuration of a first one of the extruded elements integrally forming a shoe having a hook-shaped upper region engaging a counterbalance and a platform-shaped lower region supporting a sash; and

c. the elevational configuration of a second one of the extruded elements integrally forming a sash support arm pivotally connected to a stile of the sash to engage the sash supporting region of the shoe.

40. The system of claim 39 wherein the elevational configuration of a third one of the extruded elements forms a shoe lock connected to the lower region of the shoe to be movable between deployed and undeployed positions.

41. The system of claim 40 wherein the shoe profile configures a pin groove for receiving a pivot pin supporting the shoe lock.

42. The system of claim 40 including a resilient latch mounted on the shoe for retaining the shoe lock in the undeployed position.

43. The system of claim 42 wherein the shoe lock and the latch are configured so that the shoe lock is manually latchable and unlatchable.

44. The system of claim 40 wherein the shoe lock is pivotally movable between the deployed and undeployed positions and is downwardly dependent from the shoe in the deployed position.

45. The system of claim 39 including a resin guide mounted on the shoe.

46. The system of claim 45 wherein the elevational configuration of a mid-region of the shoe is formed with a locking slot for receiving the resin guide.

47. The system of claim 39 wherein the sash support arm is pivotally mounted on the sash stile to move between an outwardly extending position supporting the sash and a downwardly hanging position that the support arm assumes when not supporting the sash.

48. The system of claim 47 wherein the sash support arm braces against a mounting bracket limiting movement of the sash support arm beyond the outwardly extending and downwardly hanging positions.

49. The system of claim 39 wherein the shoe is available in different widths established by different predetermined lengths of the first extruded element to accommodate different widths of jamb shoe channels.

50. The system of claim 49 wherein upper regions of different shoe widths are adapted for connecting to different numbers of counterbalance elements.

51. The system of claim 39 wherein the sash support arm is available from a plurality of extrusions having different evenly extending profiles establishing different lengths for the support arm.

52. The system of claim 51 wherein the plurality of extrusions for the sash support arm are formed with evenly extending code lines indicating different arm lengths.

53. A sash support comprising:

a. sash support arms movably mounted respectively on each stile of a sash so that the support arms hang downward in dependent positions when not supporting the sash and move outward to braced positions in response to engagement of the support arms with locked sash shoes as the sash is lowered between the shoes so that the weight of the lowered sash urges the sash support arms outward on the shoes to the braced positions; and

b. the support arms in the braced positions having end regions resting on respective sash shoes in support regions vertically under upper shoe regions where counterbalance elements are connected to the sash shoes.

54. The support of claim 53 wherein mounting brackets pivotally mount the support arms on the sash stiles and limit movement of the support arms beyond the downwardly hanging and braced positions.

55. The support of claim 53 wherein the shoes are formed of a metal extrusion having an evenly extending profile.

56. The support of claim 55 wherein the profile of the extrusion for the shoes forms upper regions connected to counterbalance elements vertically above support regions engaging end regions of the braced support arms.

57. The support of claim 56 wherein the support regions of the shoes extend toward the sash stiles to engage the support arms in their downwardly hanging positions when the sash is lowered into engagement with the shoes.

58. The support of claim 57 wherein the support arms move from their downwardly hanging positions to their outward braced positions by sliding along the support regions of the shoes as the sash is lowered.

59. The support of claim 53 wherein the sash support arms are formed of a metal extrusion having an evenly extending profile.

60. The support of claim 59 wherein a plurality of extrusions for the support arms have different evenly extending profiles establishing different arm lengths and are provided with extruded coding lines indicating support arm length.

61. A system locking counterbalance shoes to window jambs while a sash supported on the shoes is removed from between the window jambs, the system comprising:

a. the shoes having hooks that are pivotally mounted on lower regions of the shoes to move between latched and unlatched positions;

b. the hooks in unlatched positions hanging dependently downward from the shoes to engage the jambs and hook under lances formed in the jambs as the shoes rise; and

c. the hooks in latched positions being retained out of engagement with the jambs and clear of the lances.

62. The system of claim 61 wherein resilient latches are carried on the shoes for holding the hooks in the latched positions.

63. The system of claim 62 wherein the hooks are manually movable into the latched positions and are released from the latched positions by pressing between ends of the hook and the latch.

64. The system of claim 61 wherein the hooks and the shoes are each formed of metal extrusions having evenly extending profiles.

65. The system of claim 64 wherein the shoes have extrusion-formed grooves that receive pivot pins supporting the hooks.

66. The system of claim 65 wherein the shoes have extrusion-formed slots that retain resilient latches for holding the hooks in the latched positions.

67. A system supporting a sash that is laterally removable from between opposed window jambs and is supported on counterbalanced shoes that run vertically within the jambs and are separated sufficiently to allow lateral movement of the sash, the system comprising:

a. the shoes having platforms that extend toward the sash to support the sash;

b. the sash having a support arm secured to each sash stile so that the sash support arms hang downward in positions in which lower ends of the support arms engage sash end regions of the shoe platforms when the sash and the support arms are moved downward from above the shoe platforms;

c. the sash support arms being mounted on the sash to pivot between the downwardly hanging positions and outwardly extending positions in which the sash support arms engage jamb end regions of the shoe platforms as weight of the downwardly moved sash transfers to the shoes via the support arms; and

d. counterbalance elements exerting a lifting force on the shoes in regions vertically above the jamb end regions of the shoe platforms engaged by the sash support arms in the outwardly extending positions.

68. The system of claim 67 wherein the shoe platforms are configured with steps that the ends of the support arms slide downward over as the support arms move from the sash end regions to the jamb end regions of the shoe platforms.

69. The system of claim 67 wherein the sash support arms are braced against movement beyond the downward hanging positions and the outwardly extending positions.

70. The system of claim 67 wherein the sash support arms are formed of a metal extrusion having an evenly extending profile.

71. The system of claim 70 wherein the extrusions are available in different profiles forming support arms of different lengths to accommodate the sash to different window dimensions.

72. The system of claim 71 wherein extrusions of different profiles are formed with coding lines to indicate the different lengths of the sash support arms.

73. The system of claim 67 wherein the shoes are formed of a metal extrusion having an evenly extending profile.

74. A system counterbalancing a laterally removable sash supported by counterbalanced sash shoes respectively running vertically in opposed jambs arranged along opposite stiles of the sash, the system comprising:

a. support arms extending between the sash and sash shoes biased upward at lifting regions spaced from each sash stile, the support arms being arranged for transferring the weight of the sash to the shoes at support regions vertically below the lifting regions to minimize any moment arms tending to turn the shoes around horizontal axes; and

b. the support arms moving to downwardly hanging positions upon movement of the sash upward and laterally from the shoes.

75. The system of claim 74 wherein the support arms are braced in support positions transferring the weight of the sash to the support regions of the shoes, and the support arms otherwise hang downward when not transferring sash weight to the shoes.

76. The system of claim 74 wherein the shoes are formed of a metal extrusion having an evenly extending profile.

77. The system of claim 74 wherein the sash support arms are formed of a metal extrusion having an evenly extending profile.

78. The system of claim 77 wherein the extrusions are available in different profiles forming support arms of different lengths to accommodate the sash to different window dimensions.

79. The system of claim 74 wherein the shoes have platforms extending from the support regions toward the sash to engage support arms hanging downward from a sash being lowered onto the shoes.

80. A system supporting a sash that runs vertically within an opposed pair of window jambs containing counterbalance sash shoes, the sash being movable laterally of the jambs for withdrawing the sash from between the jambs, and the system comprising:

a. a pair of movable support arms engaging the sash and the counterbalance shoes and arranged for transferring the weight of the sash to support regions of the counterbalance shoes;

b. the counterbalance shoes being biased upward at lifting regions arranged vertically above the support regions to minimize any moment arms tending to turn the shoes around horizontal axes; and

c. the support arms being moved in response to lifting the sash upwardly of the shoes in a region between the lifting regions when the sash is lifted to remove its weight from the support regions.

81. The system of claim 80 wherein the support arms move in response to being subjected and not subjected to sash weight.

82. The system of claim 80 wherein the shoes are formed of a metal extrusion having an evenly extending profile.

83. The system of claim 80 wherein the sash support arms are formed of a metal extrusion having an evenly extending profile.

84. The system of claim 83 wherein a plurality of extrusions are available in different lengths to form support arms that can bridge different distances between stiles of the sash and the support regions.

85. The system of claim 80 wherein the support arms move inwardly toward the sash when the sash is lifted from the shoes.

86. A system supporting a sash that is laterally removable from between opposed window jambs, the system including counterbalance shoes arranged within the jambs to be spaced laterally from stile edges of the sash to allow lateral movement of the sash for removing the sash from between the jambs, and the system comprising:

a. sash support arms arranged for bridging distances between the shoes and stiles of the sash, the support arms being movable between sash supporting positions in which the support arms transfer weight of the sash to the shoes and sash uplifted positions in which the support arms hang downward from the sash stiles and allow lateral movement of the sash between the shoes;

b. counterbalance lifting regions for the shoes being arranged vertically above support regions that uphold the weight of the sash transferred via the support arms to the shoes so that the sash weight does not subject the sash shoes to moment arms tending to turn the sash shoes about horizontal axes; and

c. the sash support arms in the support positions being braced against moving in response to sash weight.

87. The system of claim 86 wherein the shoes are formed of a metal extrusion having an evenly extending profile.

88. The system of claim 86 wherein the sash support arms are formed of a metal extrusion having an evenly extending profile.

89. The system of claim 88 wherein a plurality of extrusions are made in different lengths to bridge different distances between stiles of the sash and the support regions.

90. The system of claim 86 wherein the shoes have platforms extending upward and toward the sash from sash weight support regions engaged by the support arms.

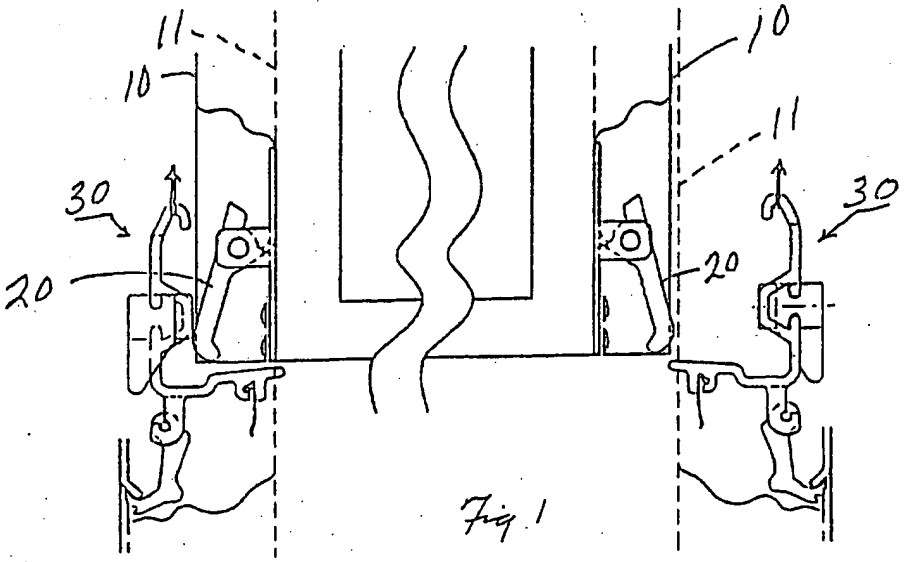

Fig 1

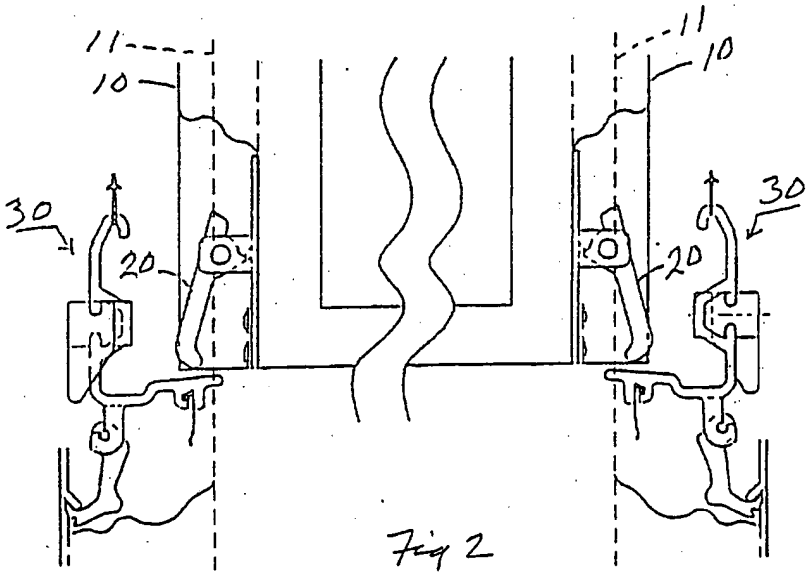

Fig 2

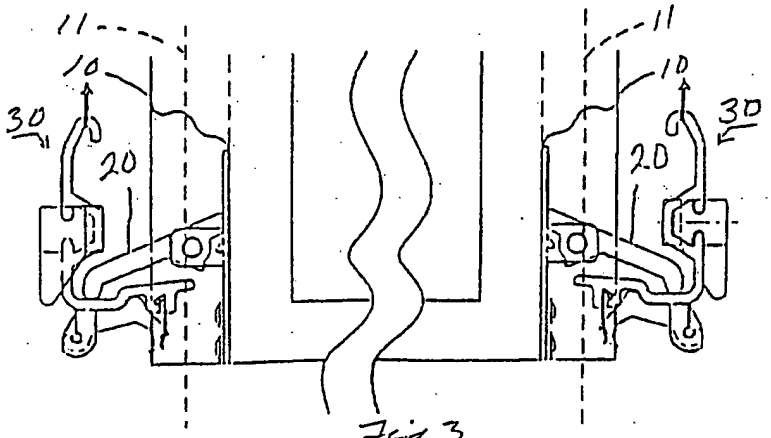

Fig 3

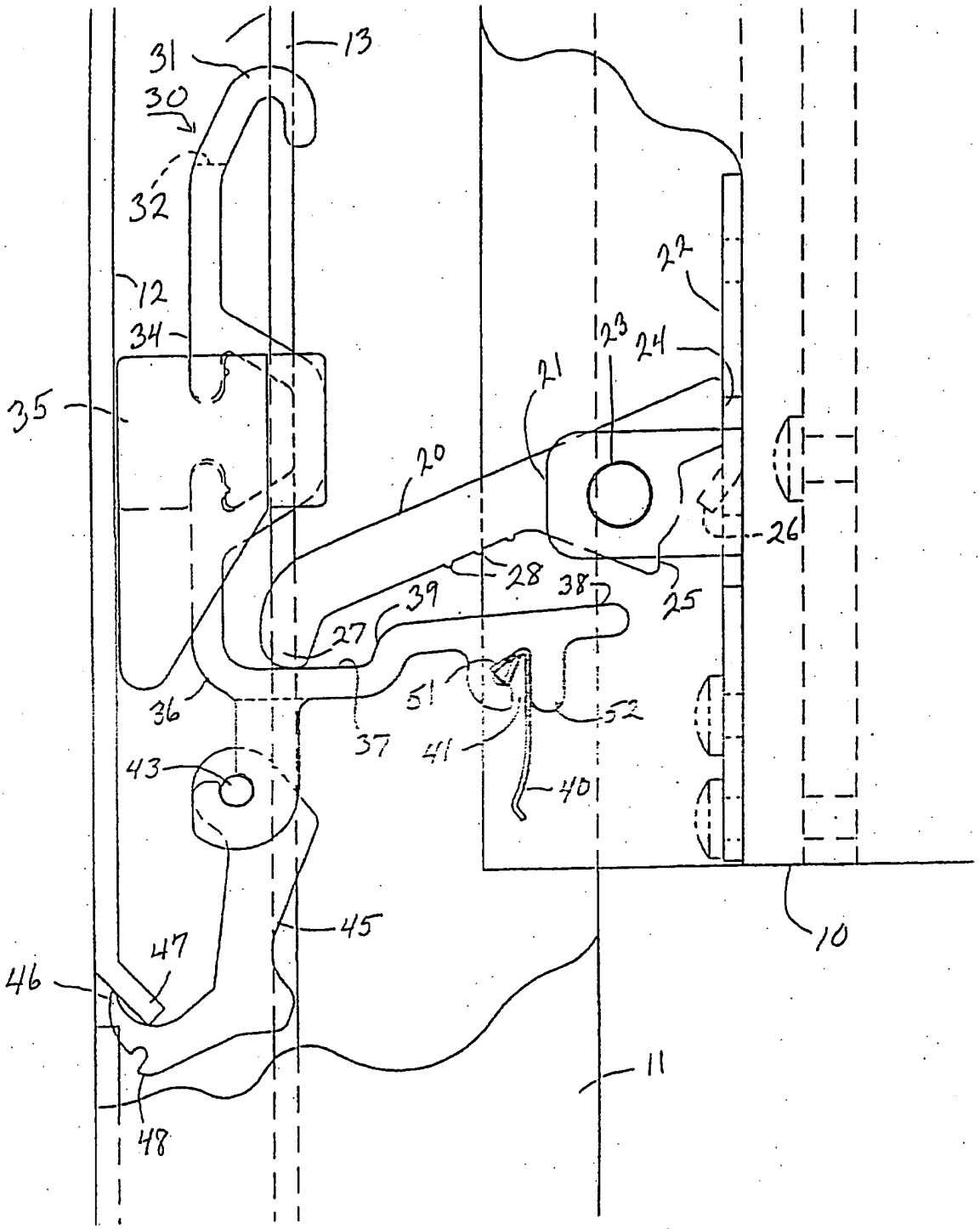
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Fig 4

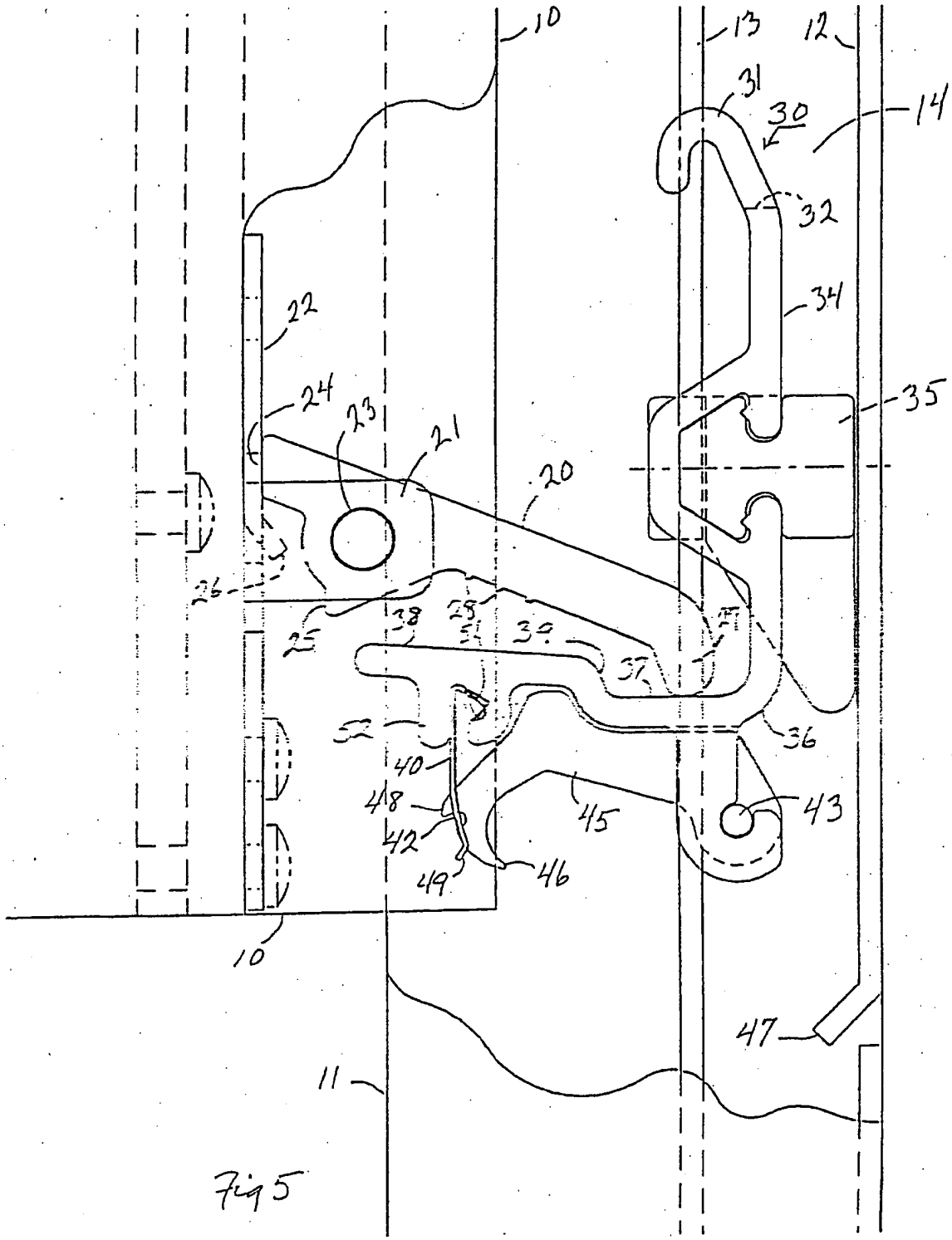
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Fig 5

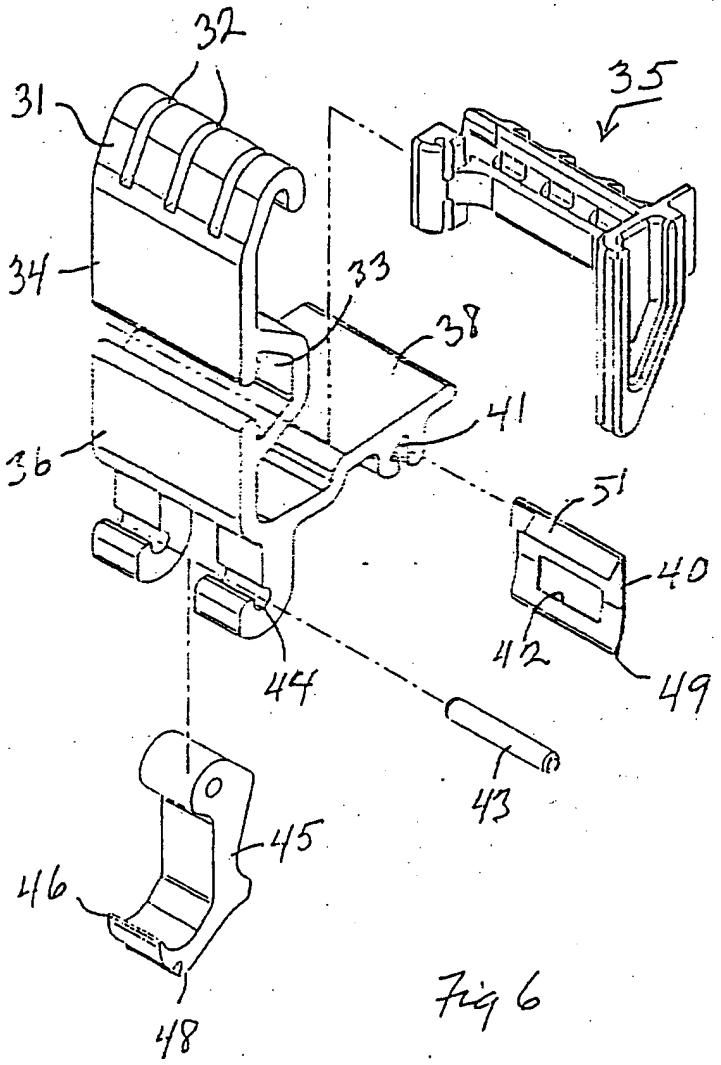

Fig 6

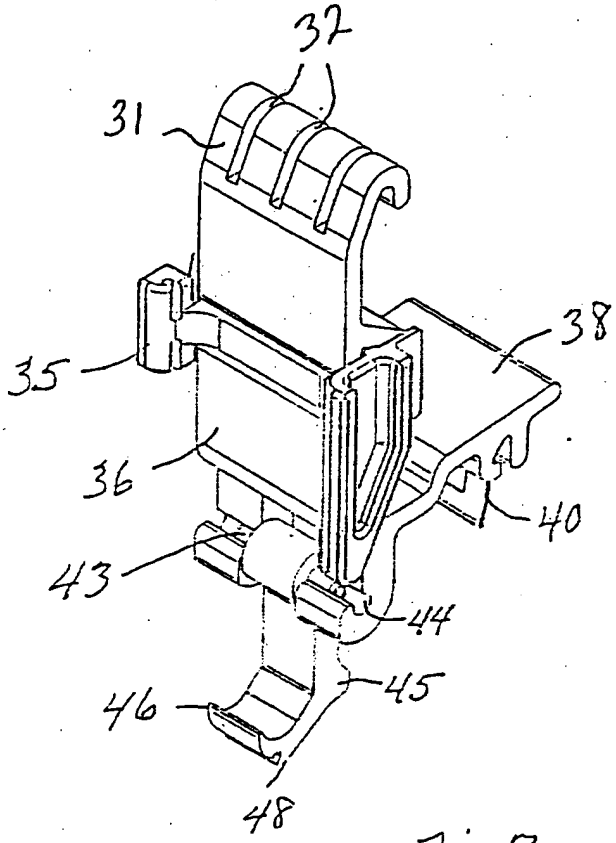

Fig 7

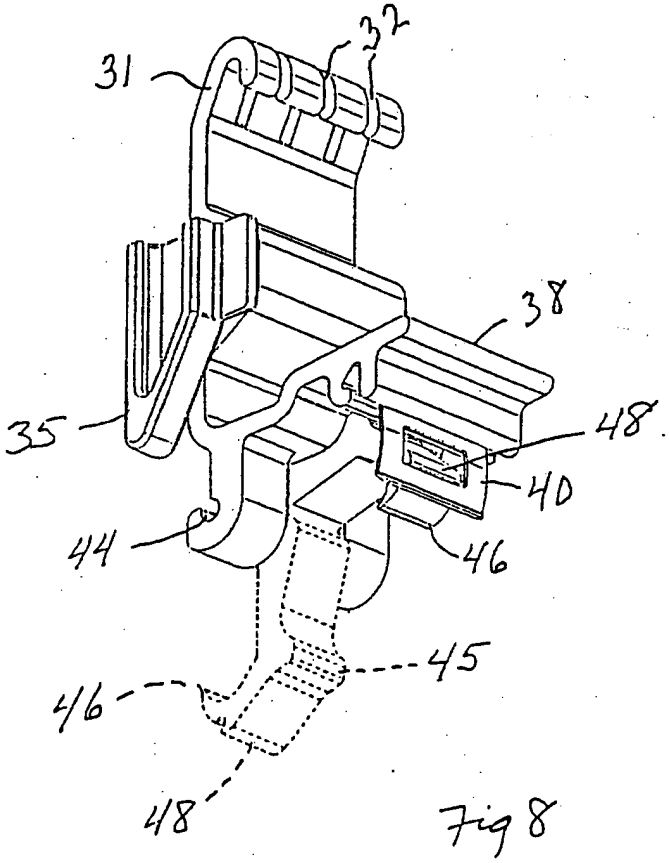

Fig 8

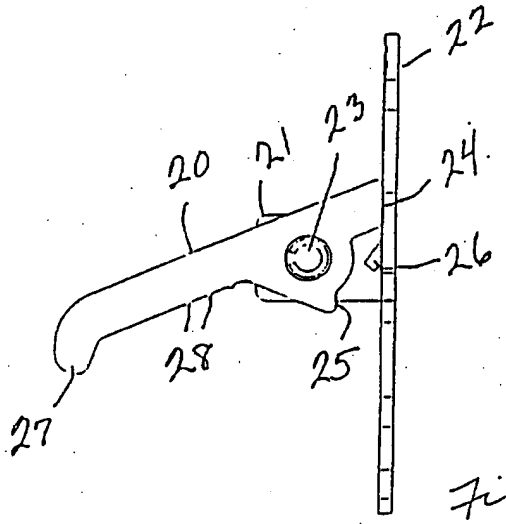

Fig 9

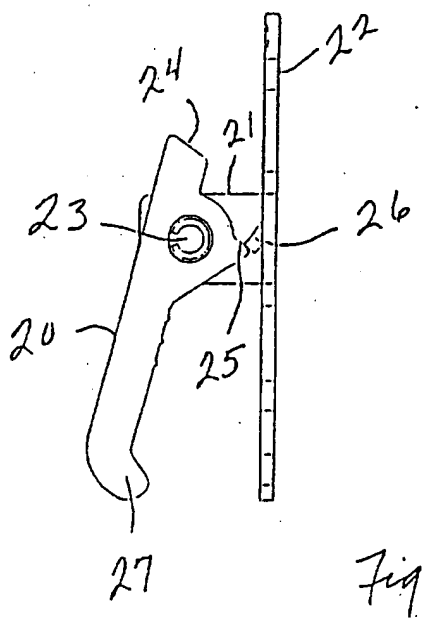

Fig 10

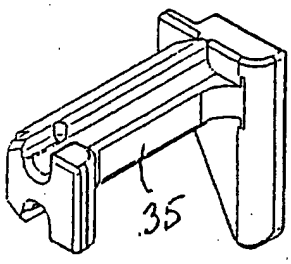

Fig 11

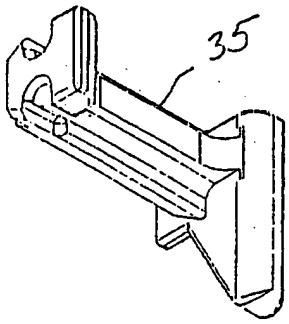

Fig 12